

# CONCORD PUBLIC WORKS WATER AND SEWER DIVISION

## GUIDELINES AND STANDARDS FOR GRINDER PUMP SYSTEMS

May 20, 2004



### **Section 1 General Requirements**

- 1.1 The preferred method for discharge of sewage from an individual building or group of buildings to the Town of Concord's public sewer system is by gravity flow. However, a sewer service for an existing building which, in the opinion of the Concord Public Works Water and Sewer Division, cannot be reasonably discharged to the Town's public sewer system by gravity flow, may be discharged into a low-pressure grinder pump system prior to discharge into the Town's public sewer system, or may be discharged by any equally efficient method, provided said grinder pump system or equally efficient method is approved by the Superintendent of the Water and Sewer Division. These guidelines apply specifically to sewer connections for existing buildings, to remediate sewage handling problems, and are not intended to apply to new construction.
- 1.2 No more than one (1) single family dwelling (or building with equivalent flow) may be connected to a single grinder pump system. Multiple connection of individual grinder pumps to a single low pressure sewer system may be permitted if the entire system is designed by a Professional Engineer registered in the State of Massachusetts and is approved by the Superintendent of the Water and Sewer Division.
- 1.3 The location and elevation of a grinder pump must be designed appropriately given the indoor plumbing layout. A Plumbing Permit shall be obtained for any work triggering the need for such permit, as specified by the Concord Building Division. Approval of a grinder pump installation by the Water and Sewer Division does not eliminate the need to obtain any applicable permits from other Town departments for building and plumbing modifications.
- 1.4 Grinder pump systems may be installed inside or outside of buildings if connecting to a gravity sewer line. Grinder pumps connecting to multiple-home low pressure sewer systems must be installed outside.

All outside installations shall be provided with a poured-in-place, concrete anti-flotation collar of sufficient size and weight to overcome buoyancy forces. Outside discharge piping shall be installed at a minimum depth of 4 feet to assure frost protection.

- 1.5 Any owner who intends to install a grinder pump or equally efficient system shall submit plans and/or specifications which indicate compliance with the general requirements described herein. Shop drawings which accompany said application should include descriptive data, design basis, performance characteristics, material specifications, a wiring diagram, and drawings of the grinder pump system in plan/elevation and the site work layout.
- 1.6 Unless otherwise specifically authorized in writing by the Superintendent of the Water and Sewer Division, all grinder pump and approved equally efficient systems shall be:
  - 1.6.1 Constructed in accordance with the general requirements herein;
  - 1.6.2 Privately owned and maintained;
  - 1.6.3 Installed on private property;
  - 1.6.4 Connected to a gravity flow system prior to entering any public street right-of-way, with this gravity system connected directly to the Town's sewer main rather than a sewer manhole; and
  - 1.6.5 Warranted for not less than twelve (12) months from the date of inspection by the Plumbing Inspector. The warranty shall cover both parts and labor.
- 1.7 In addition, any proposed grinder pump or equally efficient system shall have been used in multiple locations in two or more communities within Massachusetts for not less than five (5) years.

## **Section 2 Design Considerations**

- 2.1 Low pressure service lines shall be 1 ½" PVC pipe, SDR 21, or 1 ¼" butt-fused HDPE. PVC pressure pipe shall have push-on joints conforming to ASTM D3139 and F477. Systems shall be designed for a minimum velocity of 2 ½ feet per second in the low pressure service lines.
- 2.2 Grinder pump systems shall consist of a grinder pump suitably mounted in a basin having a minimum capacity of 40 gallons between the pump off and the inlet pipe and shall be constructed of fiberglass

reinforced polyester resin or corrugated high density polyethylene with a smooth inner surface. Each basin shall be furnished with an EPDM grommet or PVC closet flange to accept a minimum 4 ½" O.D. DWV pipe. Discharge piping shall be non-corrosive, such as 304 stainless steel or 80 PVC, and terminate outside the pump chamber with a 1 ¼" or larger fitting. If equipped with a pressure switch and the pump is in a sealed chamber, the accessway shall have a 2-inch PVC vent to prevent sewage gases from accumulating in the tank. All seams created during tank construction shall be thermally welded and factory tested for leak tightness, and all penetrations in the tank shall be sealed according to the manufacturers recommendations. The tank walls and bottom must withstand the pressure exerted by saturated soil loading at maximum burial depth, and all station components must function normally when exposed to maximum external soil and hydrostatic pressures.

- 2.3 Operating pressure of the pump shall be 20% greater than the maximum discharge head based on the system discharge. Pumps must be capable of operating at negative total dynamic head without overloading the motor.
- 2.4 The grinder shall be direct-driven by a single, one-piece, stainless steel motor shaft. The grinder pump unit shall operate without objectionable noise or vibration over the entire range of recommended operating pressures.
- 2.5 Grinder pumps shall be suitable for use with domestic wastewater. Physical properties shall include high tear and abrasion resistance, grease resistance, water and detergent resistance, temperature stability, good aging properties, and outstanding wear resistance. Grinders shall be constructed so as to avoid clogging, jamming, stalling, or overloading under normal operating conditions. The grinder shall be capable of reducing all components in normal domestic sewage, including a reasonable number of "foreign objects" such as paper, wood, plastic, glass, rubber and the like, to finely divided particles which pass freely through the passages of the pump and the discharge piping. The grinder shall provide positive flow of solids into the grinding zone with sufficient vortex to scour the tank free of deposits or sludge banks.
- 2.6 A check valve shall be built into the discharge piping, allowing a full ported passageway when open. Additionally, a redundant check valve is required either at the property line or at the pump where discharge is to a low pressure sewer system rather than a gravity sewer.
- 2.7 The grinder pump system shall be provided with an alarm light and bell with a silence push-button switch. The system shall be hard-wired to a transfer switch in order to permit operation by an emergency power

source or have an emergency storage capacity above the working level of the chamber (or by connection to an overflow tank) equal to the daily design flow of the system. Duplex units shall have alarm lights which shall indicate when one pump requires service. A single NEMA electrical quick disconnect shall be installed for all power functions. The electric motor shall have an automatic-reset, integral thermal overload protector. The station shall also be equipped with a push-to-run switch and redundant pump starting control, a pump removal system, a shut-off valve, and an anti-siphon valve, unless otherwise approved by the Water and Sewer Superintendent. If located outside, the electrical and alarm controls shall be located in an enclosure manufactured of materials appropriate to ensure corrosion control.

- 2.8 If an overflow tank is used, and the tank is not self-draining, the level in the tank must be regularly checked and the tank pumped as needed, to avoid having a full tank prior to an emergency. Overflow tanks shall be watertight, physically located outside of the house or building, and readily accessible for inspection and pumping.
- 2.9 The grinder pump unit shall be constructed so as to facilitate easy pump removal when necessary. All mechanical and electrical connections must provide easy disconnect accessibility for grinder pump unit removal and installation. A push-to-run feature will be provided for field trouble shooting. All motor control components shall be mounted on a readily accessible bracket for ease of field service. Maintenance must be possible without requiring OSHA Confined Space Entry.
- 2.10 The grinder pump shall be free from electrical and fire hazards. As evidence of compliance with this requirement, the completely assembled and wired grinder pump system shall be listed by Underwriters Laboratories, Inc. to be safe and appropriate for the intended use.
- 2.11 The grinder pump shall meet accepted standards for plumbing equipment for use in or near residences and shall be free from noise, odor, or health hazards.
- 2.12 Equipment and appurtenances must be designed in conformity with ASA, ASME, AIEE, and NEMA standards.

### **Section 3 Installation, Inspection and Maintenance**

- 3.1 The grinder pump shall be delivered to the site assembled and tested, ready for installation. Prior to delivery, the unit must be factory tested. Included in this procedure will be testing of all ancillary components such as the anti-siphon valve, check valve, discharge line, level

sensors, and controls. Actual appurtenances and controls installed in the field shall be particular to the tested pump only.

- 3.2 An authorized service representative must be on-site to inspect, operate, test, and adjust the equipment as needed before use. Inspection shall include: soundness of materials, without cracks or otherwise damaged; completeness in details, as specified, correctness of settings, alignment, and relative arrangement of various parts; and adequacy and correctness of packing, sealing, and lubricants.
- 3.3 The operation, testing, and adjustment shall be as required to prove that the equipment is left in proper condition for satisfactory operation under the conditions specified. Where called for in the manufacturer's specifications, vibration readings shall be made and the equipment balanced accordingly. During field testing, each unit shall be operated to demonstrate its ability to pump without excessive vibration, motor overloading, or overheating. Each pump shall be operated for a sufficient period of time to permit thorough observation of all pump components.
- 3.4 Thrust blocks shall be used for all fittings on buried pipe.
- 3.5 Excavation, pipe laying, and backfilling shall be performed in accordance with applicable Town specifications.
- 3.6 Prior to placing the unit in service, a report shall be submitted to the Water and Sewer Division on inspection, operation, adjustments, and tests. The report shall include detailed descriptions of the points inspected, tests and adjustments made, quantitative results obtained if such are specified, and suggestions for precautions to be taken to ensure proper maintenance. The report shall also include a written certification that:
  - 3.6.1 The equipment conforms to the requirements of the contract and has been installed in accordance with these Guidelines and Standards for Grinder Pump Systems.
  - 3.6.2 The alarm light and bell have been tested and are operational.
  - 3.6.3 The system has been hard-wired, if applicable, to permit operation by an emergency power source and the system has been test run on an emergency power source or the system has been constructed with an emergency storage capacity equal to the daily design flow of the system.
  - 3.6.4 The equipment is ready for permanent operation and nothing in the installation will render the manufacturer's warranty null and void.

- 3.7 The user and the town shall each be furnished with a complete set of instructions, technical bulletins, and any other printed matter such as diagrams, prints, or drawings, containing full information required for the proper operation, maintenance, and repair of the equipment. Included in this submission shall be a spare parts diagram and a complete spare parts list. This submission shall be bound in one volume, with the installation address and the manufacturer's name and phone number shown on the first page.
- 3.8 A sign not less than 8 1/2 x 11 inches shall be posted adjacent to any inside system, or in the case of an outside system, adjacent to the main electrical panel in the building providing the following information in bold print:
- (a) Sewerage from the subject building is discharged by means of a grinder pump or approved equally efficient system.
  - (b) Said system is privately owned and all maintenance shall be the responsibility of the owner of the property.
  - (c) The name of the pump manufacturer and the name, address, and phone number of the local distributor and one or more authorized local maintenance and service center(s), including one that provides 24-hour service.
  - (d) A description of the system including model number and instructions for operating the system including, if applicable, instructions for operation with an emergency power source.

## Checklist for Grinder Pump Installation

The following items must be completed by the grinder pump owner or the owner's representative:

- ☐ Obtain any applicable permits required from the Concord Building Division for plumbing and/or building modifications.
- ☐ Submit plans and specifications to the Water and Sewer Division, in accordance with Items 1.5 and 3.7 of these guidelines. (Note that plans for multiple-home systems must be stamped by a Professional Engineer registered in Massachusetts.)
- ☐ Retain a complete set of drawings and instructions, diagrams, and/or prints required for proper operation, maintenance, and repair of the equipment. Also provide a copy of these documents to the Water and Sewer Division.
- ☐ Confirm manufacturer's warranty is a minimum of 12 months including parts and labor.
- ☐ Submit inspection report provided by authorized service representative (see "Inspection Report Requirements").
- ☐ Post 8½" x 11" sign showing the information described in Item 3.8 of these guidelines.

## Inspection Report Requirements

An authorized service representative, present during pump startup and testing, shall provide a report describing the points inspected and the tests and adjustments made, including quantitative results if required by the manufacturer's specifications. The report shall also include suggestions for precautions to be taken to ensure proper grinder pump maintenance. In addition, please confirm the following and include this page with the inspection report:

- ☐ The grinder pump system has been factory tested in accordance with the manufacturer's specifications.
- ☐ The equipment conforms to the requirements of the contract and has been installed in accordance with these Guidelines and Standards for Grinder Pump Systems.
- ☐ The pump is in proper condition for satisfactory operations under the specified conditions.
- ☐ Materials are sound and free from damage or cracks.
- ☐ Settings, alignment, and arrangement of parts are correct.
- ☐ Packing, sealing, and lubricants are adequate and correct.
- ☐ Where specified by the manufacturer, vibration readings have been made and equipment balanced accordingly.
- ☐ The pump has been operated to confirm ability to run without excessive vibration, noise, motor overloading, or overheating.
- ☐ The alarm light and bell have been tested and are operational.
- ☐ The system has been hard-wired, if applicable, to permit operation by an emergency power source and the system has been test run on an emergency power source or the system has been constructed with an emergency storage capacity equal to the daily design flow of the system.
- ☐ The equipment is ready for permanent operation and nothing in the installation will render the manufacturer's warranty null and void.

Authorized Service Representative performing inspection:

Name: \_\_\_\_\_

Company: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

Phone: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_